Emerging psychoactive substances in Australia

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Statement of Sources

I declare that this report is my own original work and that the contributions of others have been duly acknowledged.

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Acknowledgments

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Abstract

The internet provides a growing medium for the emergence of psychoactive substances, with very little information pertaining to the safety of their use. It is imperative that these Emerging Psychoactive Substances, (EPS), are monitored, in order to detect new substances, and thus allow for researchers and clinicians to prepare for the effects of these substances on the general population. The current research aimed to implement a pilot internet monitoring system to replicate the Psychonaut Web Mapping Project in Europe. From this pilot data, the second aim was to provide a narrative review of the top ten identified EPS available to Australian markets. The study implemented a 12 month internet monitoring system and identified 43 online stores providing EPS to Australia, with a total of 212 total products identified as available to Australian consumers. The top ten most common EPS identified using the pilot monitoring system were: MDAI, 5-IAI, Methiopropamine, 5-MeO-DALT, 4-FMC, 4-MEC, MDPV, Butylone, DMAA, and Methylone. These substances were then researched on user forums to provide greater information on subjective user experiences, with a focus on physical or psychological harm and potential for substance abuse and dependence. MDPV was most frequently associated with harm in user reports, in addition to being identified as potentially addictive. This finding has been verified in the research literature more generally. The current findings indicate that there is a need to monitor the ever changing internet market in order to have some knowledge of the new substances that may be consumed by individuals in Australia. Furthermore, there is a need for more research and available information, in order to provide recreational users with evidence-based information. The potential for psychological harm has been verified, with a particularly concerning trend toward newly identified substances of abuse.

There is a growing need to provide health care workers, and governing bodies, with information pertaining to the effects of these drugs, and their potential for abuse.

The use of psychoactive substances in human populations has occurred and been documented from very early on in human history. From the spiritual use of hallucinogenic substances, to the more recent use of psychoactive substances to induce recreational euphoria, energy, and other desirable effects. The consumption of traditional psychoactive substances, ones that have well known properties, such as ecstasy, methamphetamine, and cannabinoids, is evolving into a market of less well known substances (EMCDDA, 2012). In the literature to date, these substances, which can produce stimulant, entactogenic, psychedelic and cannabinomimetic effects, are becoming more prevalent. One of the key research bodies in Australia, The Ecstasy and Related Drugs Reporting System, (EDRS), who investigate substance use with ecstasy and other psychostimulant users, refer to these new chemical products as Emerging Psychoactive Substances, or EPS, (EMCDDA, 2012). Researchers in the United Kingdom use the term Novel Psychoactive Substances (NPS). In Australia, EPS have been identified as being used by regular ecstasy users (N=693), with a small percentage of the interviewed sample reporting use of psychedelic phenethylamines, (1-2%), psychedelic tryptamines (<1%), and Stimulant EPS (16%) (Sindicich & Burns, 2011).

Currently, the rate of discovery for EPS is astounding, with the EMCDDA (2012) reporting 170 new online drug shops in 2010, increasing to 693 in 2012. Seven of the top ten most prevalent drugs identified by the EMCDDA were EPS. Due to the nature of illicit recreational substance use in society, chemical producers are looking to capitalise on the production of newer, more elaborate/complex psychoactive substances, in order to import and distribute them in countries where the law is unable to keep up with an ever expanding market (EMCDDA).

EPS can be sold in traditional stores or, on the internet by typically untraceable online producers and distributors (Psychonaut Web Mapping Project, 2010; 2012; EMCDDA, 2012, Measham, Moore, Newcombe & Welch, 2010). As such, the easily accessible nature of these substances incites a question into the nature of these chemicals, and the possible effects that they may have on unsuspecting populations. As previously mentioned, because these substances are often produced very rapidly, or by companies which do not intend them to be used recreationally, there is little to no testing on the effects of said substances in human populations. Often, consumers test these drugs for the first time, with little to no knowledge of the potential psychoactive effects, or their long term consequences. Within the online community, some recreational drug users have come to produce their own online database, cataloguing the effects of these new substances. These users have been termed 'psychonauts' and have been known to post on online forums, such as Pillsreports, Bluelight.ru and Erowid.org (Psychonaut Web Mapping Project, 2010; 2012). These psychonauts play a valuable role in providing other users with information about the physical and psychological effects of these substances. Despite the existence of online users, who are willing to risk their health in order to provide other users with a database cataloguing the effects of EPS, it remains of utmost importance that these EPS are both monitored, and tested, and that this information is dispersed to both the research and wider population.

In Europe, the emergence of new psychoactive substances has been monitored since 2006 (Psychonaut Web Mapping Project, 2010; 2012, EMCDDA, 2012). This is in order to both create a database of, and monitor the prevalence and use of these substances, and to also investigate and create a means to access all of the information available to researchers in regards to the chemical properties, psychological, and

physical effects of these substances in human populations. Additionally, these monitoring systems are able to provide an early warning system for EPS that may be particularly problematic. In Europe, the findings of the RedNet project, now known as the European Psychonaut Web Mapping Project is alarming. There has been an exponential rise in the number of vendors who are selling to European countries. In January 2010 alone, there were 170 online vendors to purchase EPS. In 2012, this number had risen to 693. The rise in the sheer number of these vendors has implications for the availability and dispersion of these substances throughout Europe. Despite data being available on European markets, it is questionable how generalisable such research is to an Australian context (Psychonaut Web Mapping Project, EMCDDA).

First and foremost, some European vendors will not supply to countries other than the EU, and secondly, the internet sites that do appear to Australian markets may supply different types of EPS. Thus the range of products and relative availability of these products may differ substantially when looking at Australian relevant markets. In New Zealand, the existence of a prominent legal high market may imply that Australian markets are subject to a different range or variety of EPS, than those available to European or American markets (Wilkins & Sweetsur, 2010). Due to the possibility of these differences, there is a need to investigate and determine the availability of EPS to Australian consumers.

The EPS that have been discovered, and anecdotally recorded, have been linked to significant harm (Borek & Holstege, 2012; Durham, 2011; Murray, Murphy & Beuhler, 2012; Rosenbaum, Carreiro, & Babu, 2012; Ross, Watson & Goldberger, 2011; Sanders, Lankenau, Jackson Bloom & Hathazi, 2008; Thornton, Gerona, & Tomaszewski, 2012). In some instances, the labelling provided by manufacturers is

misleading or inaccurate, leading to misinformed consumers who are purchasing substances with unknown chemical contents. These EPS are sometimes sold as 'legal highs', 'research chemicals', or 'bath salts', in order to reduce the level of suspicion that may be raised by regulatory bodies. Furthermore, the addition of the proviso of sold 'not for human consumption', adds to the surreptitious sale of these products to recreational users. The main issue of misleading labelling or selling EPS as 'not for human consumption' lies twofold: the regulatory bodies may not realise the intended purpose of such products, (i.e. for recreational use), and users of these products may be consuming an unknown substance at an unknown level, resulting in a greater severity of physical or psychological harm. This harm may be initial, such as poisoning, temporary episodes of psychosis, or memory lapses/loss of control, or may be in the form of long term psychological abuse and dependence (Baumann, et al., 2012; Bloomer, Innocence, Farney, Bell & Canale, 2011; Watterson et al., 2012). There is evidence of both short and long term negative outcomes as a result of recreational use of EPSThese substances are emerging so rapidly that systematic study of long term effects is difficult. One substance that has become prevalent in use, and thus provides some insight into both short and long term harm, is Mephedrone.

Mephedrone (4-methylmethcathinone, 4-methylephedrone Stimulant (S) & Entactogen (E)), became a known substance in 1929, and began to be distributed in 2004 by a website called Neorganics. In 2008 it was reportedly present in Australia. In 2010 it was banned in the United Kingdom, however it was still being sold by dealers in late 2010 (Winstock & Marsden, 2010). The precursors for the production of Mephedrone, when it originally emerged, were more easily obtained than MDMA, thus adding to its rapid production, consumption, and wide availability. It is usually

sold as a white powder (which can vary from a crystalline white to yellow colouration). The chemical is soluble and has been described to have an unpleasant odour. Mephedrone has also been sold in capsule and tab form, and has been reportedly sold under the guise of ecstasy tablets. Users administer the drug through a variety of means, most often through snorting, although it is also administered through bombing, and shelving/shafting (Matthews & Bruno, 2010; Measham, Moore, Newcomb & Welch, 2010; Schifano et al., 2011; Winstock & Marsden).

Winstock and Marsden (2010) have documented the acute subjective effects of mephedrone on users by using telephone interviews and testing urine samples. They found that users reported both positive and negative physical and psychological effects. The positive effects included euphoria, stimulation, elevated mood, lessened aggression, heightened sexual arousal, improvements in mental functioning, and heightened appreciation for music. The reported negative effects were: loss of concentration, reduced visual focus, memory deficits, reduced awareness/consciousness, strange behaviour, agitation, and loss of sleep. Most disturbing of the negative effects were anxiety, hallucinations, and delusions, which were mostly associated with prolonged use, or high dose levels, in addition to use with other substances such as alcohol, ketamine, GHB, and other psychostimulants. If evidence was present of long term injecting administration, these effects were particularly prominent. A noteworthy exception to negative effects of mephedrone was that aggression was reportedly less common when compared to cocaine (Winstock & Marsden).

Mephedrone has been reported to produce both withdrawal and comedown effects. These include increased appetite, stuffy nose, tiredness or fatigue, unusual body odour, anxiety, depression, emotionality/tearfulness, irritability, inability to

concentrate, loss of memory, and urges or cravings to re-administer (Matthews & Bruno, 2010; Measham, Moore, Newcomb & Welch, 2010; Schifano et al., 2011; Winstock & Marsden, 2010). In terms of negative psychological outcomes, including abuse and addiction, the existence of symptoms such as urges to take more of the drug, and feeling anxious or depressed as the drug wears off, are troubling. Although mephedrone provides only one example of an EPS, the implications of substances being widely dispersed among the population, which are not regulated or tested, and have the potential to lead to addiction or contribute to the onset of other psychological disorders, is concerning.

In terms of dependence specific symptoms, Winstock and Marsden (2010) found that users developed cravings for mephedrone, used for longer periods of time, or in greater amounts than what they had intended, and were concerned about their use. Furthermore, users reported tolerance to the effects of mephedrone. Additionally, the users of mephedrone reported that their motivation to use the substance was highly influenced by its legality, (though this was not reported for mephedrone specifically), and its distribution through online sources. This raises the issue of the rapidly rising number of EPS, and heightens the link between the legality of the substance, and its availability online, and the motivation for recreational users to purchase such substances (Bruno et al., 2012; Psychonaut Web Mapping Project, 2010; 2012; Schifano et al., 2011; Winstock & Marsden, 2010).

Mephedrone use, along with other EPS, has been reported in Australia. The EDRS (2010) found that frequent ecstasy users (n=163) reported consuming a range of psychedelic phenethylamines along with psychedelic tryptamines and stimulants, such as mephedrone. Of the 21% of frequent ecstasy users who reported using mephedrone, 30% reported only using it once. Other EPS, such as

methylenedioxypyrovalerone (MDPV) and methylone have been identified in chemical analyses of wastewater in urban areas and at other venues, such as music festivals (Chen et al., 2012), while local media have reported harms associated with EPS use (Chamberlin, 2012; Olding, 2012). Bruno and colleagues (2012) found that among regular ecstasy users (REU), use of EPS was evident in over 25% of those surveyed. This use was limited to predominantly mephedrone (stimulant), as opposed to psychedelics (reportedly used by 13% of those surveyed). Mephedrone was most commonly used in Tasmania (47%) and Victoria (28%) and was found to be associated with harms such as risky behaviour.

Aims

The aim of the current project was to implement a pilot web monitoring system, using the methodologies of the Psychonaut Web Mapping Project. The purpose of this was to determine the existence of websites that readily supplied EPS to Australia, in order to monitor their products. In addition to monitoring, and the identification of both vendors and substances being sold, the second aim was to research and catalogue detailed information about the chemical nature of the substances being sold. For each prevalent EPS, user forums were investigated, in order to record qualitative information about the potential psychological effects of these chemicals on both one off, and regular EPS users. This information was then collated, in order to provide structured summaries of EPSs, including their availablility,, and reported psychological and physical effects

Method

Study 1

Design

Study 1 involved the implementation of a pilot internet monitoring system in Australia. Quantitative analysis was used to determine the magnitude of monthly searches for EPS within Australia, the number of stores selling EPS to Australia, the six month survival rates of stores, the stimulant, entactogen and psychedelic 'blends' available to Australian consumers, and the stimulant, entactogen, psychedelic, and dissociative products available to Australian consumers. The study aimed to discover the top ten most frequently advertised for sale substances available within online websites.

Apparatus

To determine the magnitude of online searches for EPS within Australia, the Google Adwords tool was used on a monthly basis. This tool was able to provide data on the number of local monthly searches for the key terms used in the study. A computer and internet, with specific search tools – Google, Yahoo, and Bing were used, as the search tools to uncover the website vendors supplying EPS to the Australian market.

Procedure

Via reproduction of the methodology employed by the European Psychonaut Web Mapping Project, a standardised set of search terms was produced. These included, ('legal high' OR 'herbal high' OR 'smart drug' OR 'research chemical" OR 'bath salt' OR 'plant food' OR 'party powder' OR 'party pill' OR 'ethnobotanical'). These terms were entered into the top Australian search engines, which were, according to Alexa.com: Google.com.au, Yahoo.com, and Bing.com using default settings. Searches were made on one day per month, within a 7 day period from the 15th day of the month. This involved searches, which were terminated following 100

sequential search returns where no EPS retailer was identified. Internet retailers that were identified as selling stimulant or psychedelic EPS to Australia were then monitored, which included documentation of the available stock, and ongoing monthly inclusion in monitoring. During each search, the continued activity of these websites was confirmed, and their current stock was updated. If the website was found to be inactive or no longer providing to Australia, they were removed from the list of active websites. The prevalence of monthly web searchers from Australia was estimated using the Google Adword's tool.

Results

Study 1

The internet monitoring pilot found a total of 43 internet vendors providing EPS to Australia (see Figure 1), 37 of which were no longer monitored due to inactivity or no longer selling EPS to Australia . In a six month period, the survival rate of each identified vendor was markedly reduced, (see Figure 2). The internet monitoring system identified a total of 212 new products to Australian markets over a 12 month period, with an average of 10 new products identified each month (see Figure 3). These products were identified as having stimulant, entactogenic, psychedelic and dissociative chemical ingredients. These results suggest that the Australian public is able to purchase from a variety of online vendors, and that these vendors do in fact supply substances with varying degrees of psychoactive properties. These vendors do not appear to last long, with only 57% of stores remaining at a 6 month follow up period.

Figure 1

Figure 1. Stores selling to Australia by month. Lighter grey areas indicate new stores identified in the month.

Figure 2

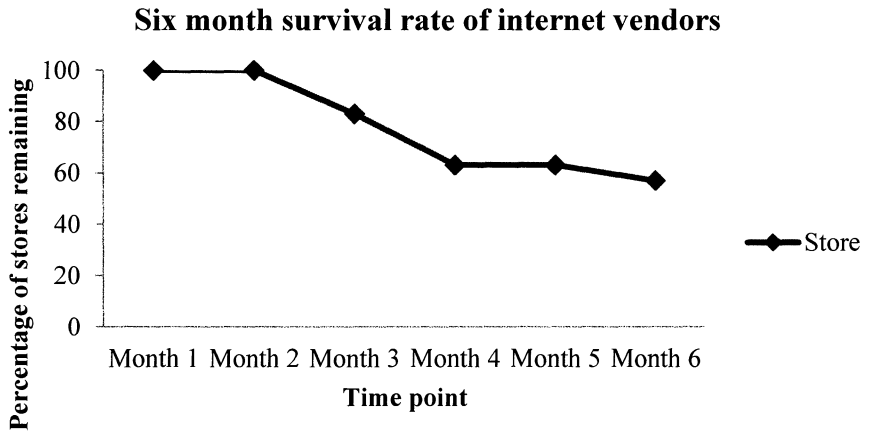


Figure 2. Percentage of online vendors remaining after a 6 month period of internet monitoring.

Figure 3

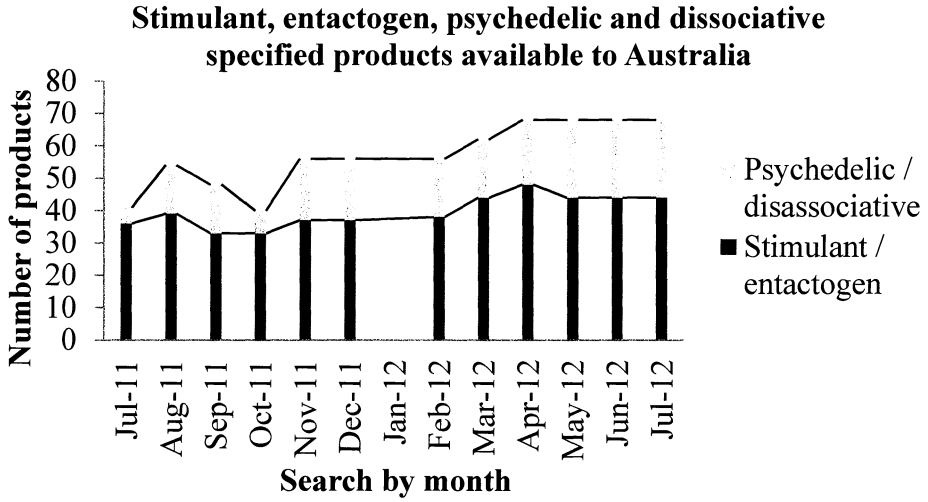


Figure 3. Number of available products, categorised by effect (psychedelic/dissociative versus stimulant/entactogen) over each month in Australia.

Preliminary Discussion

Study 1

Internet searches within Australia indicate an interest in EPS by Australian consumers. There are limited retailers selling EPS to Australian consumers in comparison to the European market (Psychonaut Web Mapping Project, 2010; 2012). The pilot internet monitoring system has identified that there are a variety of substances being made available to Australian consumers, with a total of 212 'blends' (chemical contents unspecified), and 86 specified chemicals, identified during the 12 months of monitoring.

The evidence suggests that these products are not simply harmless every-day substances, under the guise of clever product marketing; rather, they do appear to contain psychoactive chemicals. The evidence from US analyses of 'blends' has confirmed the presence of chemical substances, such as MDPV, methylone and

mephedrone, either as a singular chemical substance, or in varying combinations (Spiller, Ryan, Weston & Jansen, 2011). Purchased 'blends' have been found to contain MDPV (Murphy, Dulaney, Beuhler & Kacinko, 2012; Murray et al., 2012; Spiller, Ryan, Weston & Jansen). Reports from the U.S. have indicated adverse health effects to users of stimulant 'blends'. This could be due to either the substance itself causing harm, or the unknown information pertaining to the nature of the substances being consumed, leading to use above and beyond what consumers would initially consider 'safe doses'. This is in addition to the many instances of substances, identified to have chemical contents with psychoactive properties, being directly found to have negative physical and psychological effects (Dorairaj, Healy, McMenamin & Eadie, 2012; Gee, Jerram & Bowie, 2010; James et al., 2011; Johnson, Conarty & Nichols, 1991; Schifano, Corkery & Ghodse, 2012).

MDPV has frequently been associated with sympathetic effects, such as tachycardia, hypertension, hyperthermia, and seizures. Psychological effects reportedly found are panic attacks, agitation, paranoia, and hallucinations (Ross, Watson & Goldberger, 2011). A case study of MDPV found that a 23-year-old male was admitted to the Emergency Department, experiencing 'bizarre behaviour', suicidal thoughts, and hallucinations (Thornton, Gerona & Tomaszewski, 2012). An instance of MDPV use in the USA resulted in one user developing agitated and aggressive behaviour, resulting in cardiac arrest (Murray, Murphy & Beuhler, 2012). Other instances of hyperthermia, organ failure, paranoid psychosis and seizures have also been identified (Borek & Holstege, 2012; Durham, 2011). Further to these psychological harms, the addictive and reinforcing properties of MDPV specifically are beginning to be more widely researched (Baumann et al., 2012; Watterson et al., 2012).

The monitoring system's ability to discern specific chemicals available to Australian markets is hindered by the rate at which retailers and products become no longer available to consumers. This may result in some difficulty for consumers in keeping up with information, and reporting adverse effects that they have been experiencing from the use of these substances. Furthermore, health agencies may be unable to track and create appropriate harm minimisation strategies, or provide sufficient information to the public and consumers. In addition to this, health care providers, in particular, clinical psychologists, or law enforcement agents may not be aware of the effects of such substances, with their increasing use and changing nature very difficult to both identify and follow over time. The very nature of internet sales of EPS is intended to outpace the legal restrictions posed by different countries and agencies. Thus, the rapid development of EPS is likely to result in a greater number of users who are not aware of the potential harms associated with the use of new chemicals, which have not been tested or well documented (Chamberlin, 2012; Olding, 2012; Murphy, Dulaney, Beuhler & Kacinko, 2012; Murray et al., 2012; Schifano, Corkery & Ghodse, 2012).

The main limitation of the current study is that it did not take into account the change in market dynamics. This would require an evaluation and updating of the search terms used during the monthly internet search. Due to the change in market advertising and availability of products, the search terms that were originally defined may not have encompassed the changing variety of retailers and products available to internet consumers. Furthermore, the internet monitoring system does not provide a complete or global picture of the range of retailers and products available to Australian consumers. The internet monitoring system was not able to capture new EPS that were reported by the media as being available in shopfronts (Olding, 2012).

This implies that new EPS can become available to consumers without being picked up by internet monitoring systems. Further to this, the harms associated with these unrecorded EPS become another unknown (to the public, researchers, and consumers). Thus, future research must include some element of recording of local non-internet retailers, and other non search identified internet retailers in order to capture the full range of retailers and products available to Australian markets.

Another limitation is that the study excluded products or websites which were selling only synthetic cannabinoids. It was decided, due to other researchers undertaking similar data monitoring for this specific substance class, that the current study would focus primarily on EPS with psychoactive and psychedelic properties only.

Study 2

Method

Design

Study 2 employed a qualitative analysis of the available information pertaining to the top ten most prevalent drugs available to Australian consumers. For the identified drugs, user forums were investigated, and user reports compiled to provide a narrative review of the chemical structure, nature, psychological and health effects of each drug on users. The study used Erowid.org, PillsReports and Bluelight.ru to find the information required to document the perceived effect of the drug, with a specific focus paid to psychological harm, dependence, and evidence of substance abuse potential. Based on the classification of narratives as relevant to the presence of either psychological or physical harms, as reported by the user, examples of such harms were compiled in order to describe the reported effects on the user. .

Participants

Participants included individuals who had used the top ten drugs, and posted user reports on user forums, found on the internet.

Apparatus

The main internet user forums used to compile user reports were Erowid, PillsReports, and Bluelight.ru. It was decided that these sites were accurately representative of reports from individuals who test EPS, with substance users on these sites employing a relatively scientific and systematic approach to the dissemination of their experiences. Implied consent was assumed for user reports, given that these websites are accessible to the public, with thread posters aware that their information is presented to a public forum.

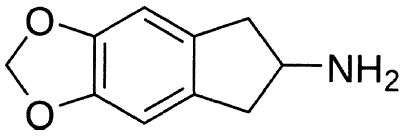
Procedure

As stated previously, the top ten drugs identified by the internet monitoring pilot were used as a guide to identify specific and potentially prevalent drugs, in order to investigate the experiences of users on user forums. Each drug was entered into the user forum search tool, and the articles posted by users were examined. The specific focus of study 2 was to identify evidence from user reports of harms, in particular psychological harms, with a specific focus on evidence of substance abuse or dependence. User reports were then combined to form a narrative review of the chemical structure of the identified substance, in addition to the user reports detailing psychological effects, and evidence of harm, (either physical or psychological). In

total, 69 user reports were reviewed, (9 for 4-MEC, 8 for 5-MeO-DALT, 7 for Butylone, 8 for MDAI, 23 for MDPV, 8 for Methylone, 2 for Methiopropamine, 2 for 5-IAI, and 2 for Flephedrone). All information provided by users was reported in the narrative reviews.

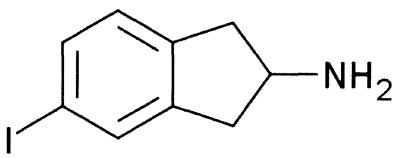
Results

MDAI



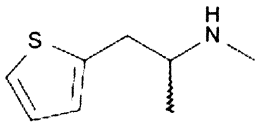
a. Effects classifications: empathogen; entactogen
b. Chemical name: 5,6-methylenedioxy-2-aminoindane
c. Description: synthetic chemical – first available in 2009 (online) – comparable effects to MDMA (ecstasy), although reported weaker effect and lower stimulation.
d. User reported psychological and physiological effects: euphoria, drowsiness, physical warmth, increased affection, enhanced hearing (music), clearer thoughts, faster reflexes, sensitivity to light and sound, increased talkativeness, and jaw tension.
e. Evidence of harm from user reports: 'slight anxiety'.

5-IAI



a. Effects classification: entactogen – 'releasing agent of serotonin, norepinephrine and dopamine' – monoamine release agent.
b. Chemical Name: 5-Iodo-2-aminoindane
c. Description: Substitute for MDMA – analogue to amphetamine – known to cause some serotonergic neurotoxicity.
d. User reported psychological and physiological effects: Bluelight.ru (no information available on Erowid.org): decrease in body temperature, strange taste, pupil dilation, positive feeling, euphoria, feelings of contentedness, increased heart rate, shortness of breath, increased body temperature, detachment from reality, increased perspiration, and clearer thinking.
e. Evidence of harm from user reports: 'when I took it, I got no high out of it (or not much of one), but felt very empty, depressed, and hopeless for like 4 hours after taking only ~25mg'(Bluelight.ru), negative mood, feelings of emptiness, depression, hopelessness, insomnia, user overdose reported. (Bluelight.ru): heart palpitations, high heart rate, and blood pressure.

Methiopropamine

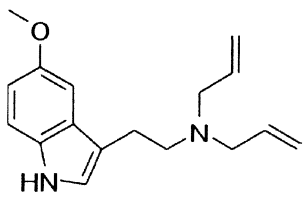


a. Effects classification: Phenethylamine – amphetamine
b. Chemical Name: N-methyl-1-(thiophen-2-yl)propan-2-amine
c. Description: Methamphetamine analogue
d. User reported psychological and physiological effects: mild euphoria, increased alertness, increased energy levels, increased sexual arousal, increased heart rate, and loss of appetite (Erowid.org).

e. Evidence of harm from user reports: psychological dependency, vasoconstriction, anxiety, difficulty urinating, laboured breathing, increased heart rate, chest tightness, hangover effects (nausea, headache, dizziness, lack of energy), and hallucinations (with prolonged use).

f. Abuse/dependence risk: 'I snorted one and sat down to wait. The drip was not unpleasant and I soon felt very stimulated. However, I had this inkling that perhaps a bit of euphoria was coming my way, so I had another line. The second line gave me a good kick so I had another… I think you get where this is going. Pretty soon I was measuring out another batch of lines, 30mg this time'… This went on to the third day. That night I began experiencing chest pains and headache. However, the thrill of it all was so compelling that I continued to use despite my growing fear that I was going to have a heart attack. I started hallucinating too… The cravings continued for about a week…I remember being very impulsive…Conclusion? This really has all the negatives of crystal meth, 4MMC, and MDPV etc… I really think this is bad stuff: it makes you careless, it is potentially toxic, and most certainly addictive; Bluelight.ru: User 'Midinoz': 'had to fight off the urge to redose (which was very strong, akin to mephedrone).

5-MeO-DALT

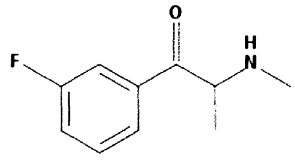


a. Effects classification: Psychedelic tryptamine

b. Chemical Name: N-diallyl-5-methoxytryptamine

c. User reported psychological and physiological effects: lightheadedness, warmth, tight chest, heavy breathing, disorientation, 'good feeling', clammy skin, hallucination, perspiration, dissociation, changes in colour and pattern perception (becomes more vivid), euphoria, increased heart rate, altered perception of reality, 'like emerging from a dream…over and over', tingling sensations, malaise, confusion, ataxia (Experience 92110), loss of orientation – time and location, visual hallucination, leg and body temor/twitches, bodily euphoria, and increased energy levels.
d. Evidence of harm from user reports: 'negative trip', panic attack, anxiety, suicidal ideation, loss of control (seen in a negative light by users), chest pains, convulsions, and seizures (during suspected overdose).

Flephedrone



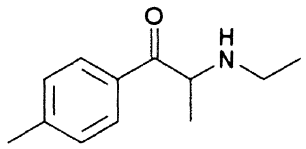
a. Effects classification: Cathinone, stimulant, euphoriant
b. Chemical Name: 4-fluoromethcathinone
c. Description: Empathogenic effects – short history of human consumption
d. User reported psychological and physiological effects: stimulation – both mental and physical, euphoria, heightened mood, empathy, increased sociability, increased desire to talk, increased concentration, increased motivation, change in consciousness, decreased appetite, dilated pupils, bodily sensations (flushing in the face, chills, goosebumps), deregulation of

body temperature, increased perspiration, increased heart rate, heightened blood pressure, nystagmus, and tremors.

e. Evidence of harm from user reports: uncomfortable bodily temperature changes, (sweating/chill), heart palpitations, impaired short term memory, tension in jaws (grinding teeth), muscle tension and pain, dizziness, vertigo, feelings of lightheadedness, headache, nausea, and numbness.

f. Abuse/dependence risk: increased desire to redose, craving for initial euphoric effects – 'compulsive use patterns' have been reported. Some evidence of psychological addiction.

4-MEC



a. Effects classification: Stimulant, entactogen – phenethylamine, amphetamine and cathinone classes

b. Chemical Name: 4-Methyethcathinone

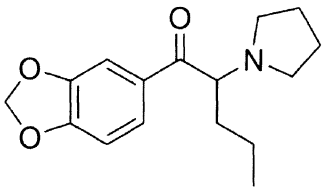
c. Description: Similarities to mephedrone

d. User reported psychological and physiological effects: euphoria, detachment from reality, relaxation, dissociation, empathy toward others

e. Evidence of harm from user reports: tachycardia, bingeing, 'emotional crash', feelings of depression, and hangover effects.

f. Abuse/dependence risk: Evidence of strong urge to redose, tolerance to effects following redosing, cravings for the drug, and loss of control over levels of use.

MDPV



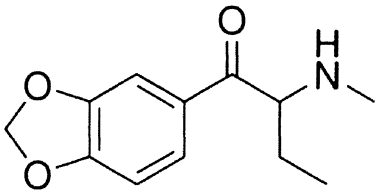
a. Effects classification: Stimulant
b. Chemical Name: 3,4-Methylenedioxypyrovalerone
c. Description: Acts as a norepinephrine-dopamine reuptake inhibitor, is known for tendency to induce 'compulsive redosing' (Erowid)
d. User reported psychological and physiological effects: Euphoria, talkativeness, increased focus, and increased alertness.
e. Evidence of harm from user reports: feelings of depression when not taking the substance, some reported anxiety, insomnia following use, impulsivity, paranoia, visual and auditory hallucinations, short term memory loss, loss of balance, nausea, inability to breathe, heightened blood pressure, tense muscles, irregular heartbeat, perspiration, stomach cramps, hospitalisation due to impulsivity/loss of control, and kidney failure.
f. Paranoia and hallucinations: 'I thought campus police was outside my house, attempting to arrest me. I thought friends and loved ones were plotting against me. I was hearing sirens and fog horns constantly, from multiple directions. I heard voices of my friends talking shit about me. I thought my

hair was falling out and bugs were crawling on me. Basically I was in hell' (Erowid.org, 2011).

g. Abuse/dependence: tolerance, cravings, users report 'being addicted', some users report daily use – mostly caused by desire to continuously redose,

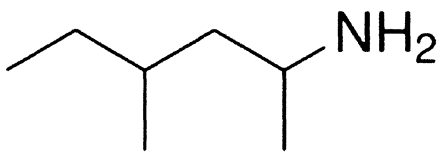
- 10 users reported suffering from tolerance, and craving for the drug, with some describing the drug as 'addictive'.

Butylone



a. Effects classification: Entactogen, psychedelic, stimulant – phenethylamine
b. Chemical Name: β-keto-N-methylbenzodioxolylbutanamine
c. Description: Metabolised in a similar way to methylone, similar effects to MDMA (Erowid).
d. User reported psychological and physiological effects: alertness, feelings of openness, loss of motivation, euphoria, cycle between energy, and loss of motivation.
e. Evidence of harm from user reports: stomach pain on comedown, depression after use of drug, and headaches.

DMAA



a. Effects classification: Stimulant

b. Chemical Name: Methylhexanamine; 1,3-dimethylamylamine

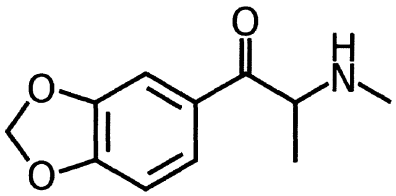
c. Description: Known as a dietary supplement

d. User reported psychological and physiological effects: increased energy, 'adrenaline like' high.

e. Evidence of harm from user reports: high blood pressure, headaches, and vomiting.

f. Has been banned by the Therapeutic Goods Administration in Australia.

Methylone



a. Effects classification: Euphoric empathogen – phenethylamine class

b. Chemical Name: 3,4-methylenedioxymethcathinone

c. Description: Synthetic empathogen

d. User reported psychological and physiological effects: heightened mood, wellbeing, positive feelings, increased desire to communicate, enhanced awareness/perception, altered perception/consciousness, euphoria, dilated pupils, decreased focus/concentration, restlessness, change in perception of time, increased body temperature, increase in heart rate, and loss of appetite.

e. Evidence of harm from user reports: Muscle tension, ache – tension in jaw, perspiration, nausea, vomiting, dizziness, confusion, paranoia, fear, racing

heart and heart palpitations, inhibited circulation, vasoconstriction, headache, and depression.

f. Abuse/dependence risk: reported by three users (Erowid.org): reported tolerance, craving for other substances – alcohol and benzodiazepines, increased use/substitution for other substances, loss of motivation – taking for granted responsibilities, andbinging (re-dosing for up to 12 hours) .

Preliminary Discussion

Study 2

A vast number of chemicals were identified as being available to Australian consumers using the pilot internet monitoring system. The top ten identified substances were then researched, with details of their chemical structure, user reported psychological and physical effects, and user reported evidence of harm collated. In the top 10 substances identified, the question remains as to how widespread their use is in Australia. Although they are available, the EDRS (2010) and other national surveys report that they are used (minimally)by Regular Ecstasy Users.

MDPV has been associated with significant harm. From a research perspective, the fact that this drug has been identified as one of the most likely to be available to Australian consumers, is concerning. The narrative review was able to identify that this substance has been associated with physical and psychological harm (including depression, anxiety, paranoia, visual/auditory hallucinations and substance

abuse and dependence), a finding that is prevalent in the research literature (Borek & Holstege, 2012; Durham, 2011; Murray, Murphy & Beuhler, 2012; Ross, Watson & Goldberger, 2011; Thornton, Gerona, & Tomaszewski, 2012). The rewarding/reinforcing effect of this substance in particular has been confirmed by Watterson and colleagues (2012) and Baumann and colleagues (2012). MDPV was found to have similar rates of drug use escalation as methamphetamine, a known substance of abuse, with what the authors describe as reinforcing properties, and high potential for abuse and addiction (Watterson et al.). From a clinical perspective, this suggests that it is not only a potentially addictive substance, (with little research data available about it), but is also available in Australia, and has the added potential to be a substance of abuse, that will likely be encountered in clinical settings.

The data available on the prevalence of use of EPS in Australia is relatively limited. However, law enforcement agencies have seized such substances from traditional storefronts and internet sources (ACaBP, 2012; Chamberlin, 2012).Use of these drugs has been reported in the US, with shipments seized by customs confirming the presence of substances such as MDPV, methylone, and mephedrone through chemical analyses (Spiller, Ryan, Weston & Jansen, 2011). Furthermore, the presence of MDPV has been confirmed in 'blends' found in Australia (Chamberlin, 2012).

The user reports identified in the narrative review of the top 10 drugs have various limitations. Firstly, they contain fairly subjective accounts from users about their experience of the substance. The amount of substance consumed by each individual may vary in terms of purity. The exact consumption amounts cannot be easily verified, and of course, there are ethical concerns with subjecting human participants to 'testing' of these substances with very little information pertaining to

their safety. Further to this, the question of whether these reports are idiosyncratic and subject to variation, depending on the users familiarity or exposure to these and other substances, requires greater research. Although this narrative review can provide some insight into the physical, psychological harm, and the potential for user abuse and dependence, it has major limitations in terms of its capacity to legitimately verify the actual chemicals being consumed by users.

Discussion

The current study aimed to pilot an internet monitoring system, in order to discover what EPS are becoming available to the Australian public. The internet monitoring system, whilst able to identify a diverse range of internet vendors and products, has some major limitations. Firstly, the search terms used over time needed to be reviewed, in order to maintain their relevance and capacity to encapsulate the dynamic and ever changing chemicals that are becoming available to consumers. Secondly, the system fails to capture the EPS that may be available through traditional shop fronts and other internet vendors.

The second aim of the study was to research and catalogue information based on the ten most prevalently advertised for sale EPS in Australia. The purpose of which was to document the effects of these drugs, (based on user reports), in terms of their, psychological, and physical effects. The top ten drugs were identified and documented, with user reports examined and reviewed to be summarised in terms of their physical/psychological effects and user reports of abuse or dependence. Some of these drugs, although not all, were associated with harm (psychological) with some users reporting experience of tolerance to the drug and craving for more of the substance. One drug in particular, MDPV, which was identified as being available to

Australian consumers through the internet monitoring system, has been shown to be associated with both physical and psychological harm, by sources other than user reports (Baumann, et al., 2012; Borek & Holstege, 2012; Durham, 2011; Murray, Murphy & Beuhler, 2012; Ross, Watson & Goldberger, 2011; Thornton, Gerona, & Tomaszewski, 2012; Watterson et al., 2012).

The current study has wide ranging implications for the mental health community, law enforcement agencies and governing bodies. Not only does the study highlight the dynamic and ever changing nature of drug use, generally, it shows that the Australian public will at some point encounter EPS of which they may have limited or no information about. The identified EPS have been shown to be associated with severe physical harms, hospitalisation, hallucinations, psychosis and even death. Individuals who may use these substances for recreational purposes may take doses at levels which they did not expect, resulting in quite severe consequences. For clinical psychologists, some substances such as MDPV may become a new drug of dependence, and may result in increasing presentations for psychological interventions. The current research could benefit greatly from some adjustment in terms of search terms used and more complete investigation into the diverse retailers distributing EPS within Australia. Furthermore, more experimental and evidence-based research is required to better inform health professionals and governing bodies about the potential for harm and abuse of these substances, in order to inform harm-minimisation and also to deal with presentations of individuals who may have been exposed to these drugs.

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